REMARKS

This paper is being provided in response to the Final Office Action mailed May 19, 2004 for the above-referenced application and accompanies a Request for Continued Examination (RCE) filed herewith. In this response, Applicant has amended claims 21 and 33 to clarify that which Applicant considers to be the invention. Applicant respectfully submits that the amendments to the claims are fully supported by the originally-filed specification. Further, Applicant submits herewith a new Declaration under 37 C.F.R. 1.132 by Dr. Colin Fox (Fox 2 Declaration) to address certain rejections set forth by the Examiner, as discussed below. Further, Applicant directs specific attention to, and references herein, the previously-submitted Declarations under 37 C.F.R. 1.132 by Dr. Colin Fox (Fox 1 Declaration), Dr. Mark Alistair Poletti (Poletti Declaration) and Charles William Brenner Wood (Wood Declaration).

The objection to the specification under 35 U.S.C. 132(a) as introducing new matter is hereby traversed and reconsideration is respectfully requested. Applicant has amended the claims for purposes of clarification. Support for the presently claimed invention, can be found on, for example, page 10, line 26 to page 11, line 37 and to Figure 7 of the originally-filed specification. Specifically, Applicant explicitly discloses digital electronic filters having at least two stages for splitting an input signal into two or more separate frequency bands, each having a different center frequency, said filters comprising a substantially equi-phase response wherein a phase response of each stage is substantially identical for each frequency band. (Note specifically page 10, lines 26-33 of the original specification.) Further, with respect to each of the two or more frequency bands having a different center frequency, Applicant directs attention to Figure 7 in which is illustrated responses of a four band equi-phase band splitter system with at least two

of the bands having different center frequencies. Applicant submits that the presently claimed invention is sufficiently supported by the originally-filed specification as would be clearly understood by one of ordinary skill in the art. Accordingly, Applicant respectfully requests that this objection be reconsidered and withdrawn.

The rejection under 35 U.S.C. 112, first paragraph, of claims 21 and 33 is hereby traversed in view of the above-noted remarks and in view of the amendments to the claims contained herein. As noted above, Applicant submits that the presently claimed invention is fully supported by the originally-filed specification and drawings. Further, with respect to the rejection to these claims as being indefinite, Applicant has amended the claims herein to clarify that which Applicant considers to be the invention. Accordingly, Applicant respectfully requests that this rejection be reconsidered and withdrawn.

The rejection of claims 21, 24-25, 30-33 and 40 under 35 U.S.C. 103 (a) as being unpatentable over U.S. Patent No. 4,589,135 to Baker (hereinafter "Baker") in view of U.S. Patent No. 4,069,732 to Moskowitz et al. (hereinafter "Moskowitz") is hereby traversed and reconsideration is respectfully requested.

Independent claim 21, as amended herein, recites a guitar preamplifier. Electronic filters having at least two stages split an input signal into two or more separate frequency bands each having a different center frequency. The filters comprise a substantially equi-phase response wherein a phase response of each stage is substantially identical for each frequency band. Two or more non-linear circuits each distorts one of the frequency bands. A summing network

recombines the frequency bands. Claims 22-29 depend directly or indirectly on independent claim 21.

Independent claim 33, as amended herein, recites a digital musical instrument preamplifier. Digital electronic filters having at least two stages split an input sampled signal into two or more separate output frequency bands each having a different center frequency. The filters comprise a substantially equi-phase response wherein a phase response of each stage is substantially identical for each frequency band. Two or more non-linear digital circuits each distort one of the output frequency bands. A digital summing network recombines the frequency bands. Claims 34-39 depend directly or indirectly on independent claim 33.

Independent claim 40 recites a musical instrument preamplifier including electronic filters. The electronic filters include a first filter network which includes an input, a plurality of outputs and a plurality of band splitter filters. The band splitter filters split a signal on the input into a plurality of different, substantially equi-phase frequency bands in which frequency bands of substantially any frequency passed by more than one of the band splitter filters are substantially in phase in all of the bands. A plurality of non-linear circuits are coupled to a plurality of the outputs to distort respective output frequency bands.

The Baker reference discloses band filtering wherein the roll-off of the lower pass filter and the rise of the high-pass filter in the vicinity of the crossover frequency are both characterized by high order transform functions that sum to unity, thus resulting in zero phase shift of the recombined signal when the outputs from the low-pass and the high-pass filters are

recombined together. (See, for example, col. 1, lines 9-15, col. 2, lines 28-33, and col. 7, lines 20-24 of Baker.)

The Moskowitz reference discloses an electric guitar which provides signals from each of its electrically conducting strings by the cutting of magnetic field lines. The Office Action cites Moskowitz as teaching two or more non-linear circuits, each of which distorts one of the frequency bands, and a summing network recombining the frequency bands.

Applicant's presently claimed invention recites an instrument preamplifier with electronic filters having *a substantially equi-phase response wherein a phase response of each stage is substantially identical for each frequency band.* Applicant's presently claimed invention is predicated on the phase shift to frequencies passed in more than one of the bands of Applicant's guitar preamplifier being substantially the same. This provides the benefits referred to in paragraphs 6 to 8 of the previously-submitted Poletti Declaration. Particularly, when the outputs of all of the bands are recombined, the same frequencies appearing in more than one band are in phase and do not cancel. Put another way, the phase shift experienced by any given frequency passed by more than one of the bands is the same so that the signals at that frequency will combine without cancellation. In accordance with Applicant's presently claimed invention, this is particularly advantageous for a guitar preamplifier where non-linear distortion is deliberately introduced into one or more of the bands. Non-linear distortion introduces harmonics at multiples of any frequency f_0 such as $3f_0$ or $5f_0$ which will appear in other bands.

Applicant submits herewith a new Declaration under 37 C.F.R. 1.132 by Colin Fox (Fox 2 Declaration). Dr. Fox has analyzed the Baker reference and has reviewed the specification and claims of the present application. Dr. Fox concludes that Baker's filters do NOT have an equi-phase response. That is, Dr. Fox concludes that the signal at a given frequency passed by two of Baker's filters which have appreciable response at that frequency will not be in phase, which is in contrast to that which is presently claimed by Applicant. (See especially paragraphs 6-8 of the Fox 2 Declaration.) Accordingly, in view of the Fox 2 Declaration, Applicant submits that the Baker filters do NOT have an equi-phase response wherein a phase response of each stage is substantially identical for each frequency band, as is claimed by Applicant.

Further, Applicant respectfully submits that Moskowitz does not overcome the above-noted deficiencies of the Baker references with respect to Applicant's presently claimed invention. Applicant submits that Moskowitz does not use electronic filtering means for separating an input signal into one or more separate frequency bands. There would be no reason to provide the electronic band splitting filtering means to Moskowitz since Moskowitz already uses a separate magnetic pickup for each string to provide separate frequency bands. It would be contrary to the device of Moskowitz to replace the separate pickup for each string instead with electronic filtering means to split the input signal into bands. An essential feature of the device of Moskowitz is arguably the provision of a separate pickup per string. Consequently, in addition to the arguments detailed above that Baker's band splitting filters are not the same as those recited by Applicant, Applicant submits that there is *no motivation to add* the band splitting filters disclosed by Baker to Moskowitz and that, moreover, Moskowitz, as noted above, in fact

teaches away from this combination, since doing so would require doing away with achieving bands by individual pickups per string which is the central thrust of Moskowitz.

Finally, it is reiterated that Applicant's presently claimed invention is the employment of equi-phase band splitting filtering in an electric guitar preamplifier, before separately applying non-linear distortion to each band and recombining the bands. The equi-phase response enables the desired distorted sounds to be better retained when recombining the bands. The sound quality of a multi-band guitar preamplifier distortion system is further improved. Both the fundamental frequency and all of the non-linearly generated harmonics will have identical phases, and will therefore combine without cancellation occurring. To Applicant's knowledge this has not been achieved previously with any prior electric guitar preamplifier, despite multi-band electric guitar preamplifiers having been proposed some years previously. The distortion products generated in each band add in-phase, preventing cancellation of the desired distortion products. As pointed out previously the output was zero-phase error as shown in Fig. 3 of the application, and demonstrates no cross-like artefacts. The result sounds more even, coherent, and natural compared to that of a system with non equi-phase filters. Technical benefits of Applicant's claimed invention are outlined in paragraphs 6 to 9 of the previously-submitted Poletti Declaration; however, further, Applicant refers to the previously-submitted Wood Declaration concerning the quality of sound produced by an amplifier according to the present claimed invention. Mr. Wood's testing of the amplifier allowed him to conclude that it is one of the most flexible guitar amplifiers that he has used and that it excelled in a wide tonal range without losing quality of sound.

Accordingly, Applicant respectfully submits that nothing in the prior art of record teaches of fairly suggests at least the above-noted features as claimed by Applicant. In view of the above, Applicant respectfully requests that this rejection be reconsidered and withdrawn.

The rejection of claim 22-23, 29, 34-35 and 39 under 35 U.S.C. 103(a) and the rejection of claim 41 all as being unpatentable over Baker in view of Moskowitz and further in view of U.S. Patent No. 4,412,100 to Orban (hereinafter "Orban") is hereby traversed and reconsideration is respectfully requested.

The Baker and Moskowitz references are discussed above with respect to independent claims 21 and 33. Claims 22-23, 29, 34-35 and 39 depend therefrom.

Independent claim 41 recites a musical instrument preamplifier system. Electronic filters split an input signal into a plurality of different, substantially equi-phase frequency band outputs in which frequency bands of substantially any frequency passed by a plurality of band splitter filters are substantially in phase in all of said bands. A plurality of non-linear circuits are coupled to the filters to distort respective output frequency bands. The filters include a cascade of a first filter network and one or more subsequent filter networks. Each network includes an input, a plurality of outputs and the plurality of band splitter filters that split a signal on the input into a plurality of different frequency bands for the outputs. For one ore more of the subsequent networks, the input of each is coupled to one output of another network via a filter to provide substantially equi-phase frequency bands on the network's outputs. Outputs of some of the networks form frequency band outputs of the filters.

The Orban reference discloses a multiband analog audio process which provides low peak-to-r.m.s ratios of audio signals. A distributed crossover system is used with bandpass filters containing internal clippers.

Applicant respectfully submits that Orban does not overcome the above-noted deficiencies of the Baker and Moskowitz references with respect to the presently claimed invention. Applicant respectfully submits that neither Orban, Baker nor Moskowitz, taken alone or in any combination, teach or fairly suggest at least electronic filters having at least two stages for splitting an input signal into two or more separate frequency bands each having a different center frequency, said filters comprising a substantially equi-phase response wherein a phase response of each stage is substantially identical for each frequency band or electronic filters for splitting an input signal into a plurality of different, substantially equi-phase frequency band outputs in which frequency bands of substantially any frequency passed by a plurality of band splitter filters are substantially in phase in all of said bands, as claimed by Applicant. Accordingly, Applicant respectfully requests that these rejections be reconsidered and withdrawn.

The rejection of claim 36 under 35 U.S.C. 103(a) as being unpatentable over Baker in view of Moskowitz and further in view of U.S. Patent No. 5,892,833 to Maag (hereinafter "Maag") is hereby traversed and reconsideration is respectfully requested.

The Maag reference discloses a form of equalizer which produces an overall phase response which is asserted to be relatively constant across the audio frequency range. A stated goal of this system is to reduce distortion (see, for example, col. 2, lines 42-46 and line 58 of Maag).

Applicant respectfully submits that Maag does not overcome the above-noted deficiencies of the Baker and Moskowitz references with respect to the presently claimed invention. Applicant specifically refers to the previously-submitted Fox 1 Declaration that analyzes and discusses the Maag reference in detail. Dr. Fox concludes that the signal at a given frequency passed by two of Maag's filters which have appreciable response at that frequency will not be in phase, which is in contrast to that which is presently claimed by Applicant. (See paragraphs 6-8 of the Fox 1 Declaration). Applicant respectfully submits that neither Maag, Baker nor Moskowitz, taken alone or in any combination, teach or fairly suggest at least the above-noted features as claimed by Applicant. Accordingly, Applicant respectfully requests that these rejections be reconsidered and withdrawn.

The rejection of claims 26-27 and 37 under 35 U.S.C. 103(a) as being unpatentable over Baker in view of Moskowitz and further in view of JP404142598 to Koichiro (hereinafter "Koichiro") is hereby traversed and reconsideration is respectfully requested.

The Baker and Moskowitz references are discussed above with respect to independent claims 21 and 33. Claims 26-27 and 37 depend therefrom.

The Koichiro reference discloses an electronic musical instrument having a musical signal generating circuit to generate digital musical sound signals. The Office Action cites Koichiro as disclosing filtering means further comprising variable cross-mixing after one or more of said stages of filtering.

Applicant respectfully submits that Koichiro does not overcome the above-noted deficiencies of the Baker and Moskowitz references with respect to the present claimed invention. In view of the above, Applicant respectfully submits that neither Koichiro, Baker nor Moskowitz, taken alone or in any combination, teach or fairly suggest at least the above-noted features as claimed by Applicant. Accordingly, Applicant respectfully requests that these rejections be reconsidered and withdrawn.

The rejection of claims 28 and 38 under 35 U.S.C. 103(a) as being unpatentable over Baker in view of Moskowitz and Koichiro and further in view of U.S. Patent No. 5,841,875 to Kuroki (hereinafter "Kuroki") is hereby traversed and reconsideration is respectfully requested.

The features of independent claims 21 and 33 are discussed above with respect to the Baker, Moskowitz and Koichiro references. Claims 28 and 38 depend therefrom.

The Kuroki reference discloses a digital audio signal processor with harmonics modification. The Office Action cites Kuroki as disclosing a preamplifier of low pass filtering means after non-linear circuits to reduce high frequency distortion products.

Applicant respectfully submits that Kuroki does not overcome the above-noted deficiencies of the Baker, Moskowitz and Koichiro references with respect to the present claimed invention. In view of the above, Applicant respectfully submits that neither Kuroki, Koichiro, Maag nor Moskowitz, taken alone or in any combination, teach or fairly suggest at least the above-noted features as claimed by Applicant. Accordingly, Applicant respectfully requests that these rejections be reconsidered and withdrawn.

Based on the above, Applicant respectfully requests that the Examiner reconsider and withdraw all outstanding rejections and objections. Favorable consideration and allowance are earnestly solicited. Should there be any questions after reviewing this paper, the Examiner is invited to contact the undersigned at 617-248-4792.

Respectfully submitted,
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Date: October 19, 2005

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